Build an AI agent

IBM SKILL BUILD

CSRBOX®
Doing Good in a Better Way

Title: AI-Driven Flood Risk Forecasting and Preparedness to Minimize Losses.

Presented by: We Goo!

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Introduction

Overview:

Severe loss during flood caused by massive rainfall.

Current Challenge:

Over-reliance on weather forecasts that fail to capture local flood risks.

Potential Solution:

ML based river discharge prediction and tracking.

Problem Statement

Develop a machine learning model to predict and track river run off based on historical hydrological ,real time weather forecast data.

Specifc Goals

Data Collection and Preprocessing.
Feature Selection and Engineering.
Model Development.
Model Evaluation.
Implementation and Validation.
Ethical and Practical Considerations.

Sustainable Development Goals

Goals Covered:

SDG 11 – Sustainable Cities and Communities
SDG 13 – Climate Action
SDG 6 – Clean Water and Sanitation
SDG 15 – Life on Land

Problem statement:

Himachal Pradeshfaces increasing landslide and flood risks due to climate change, glacier melt, and extreme rainfall. This project leverages AI for timely alerts and disaster preventIon.

Rationale:

River run off prediction to avoid massive destructions due to heavy rainfall and floods.

Data collection and preprocessing

Data Collection:

Comprehensive historical and real-time datasets, including river flow, rainfall, temperature, glacier melt, and weather forecasts

Feature selection and engineering:

Preprocessing:

Identify key features for river run off prediction.
Handle missing values.Preprocess the data for model training
Engineered new features to enhanced model perfomance.Ex. lag,aaverage rainfall,glacier melt

Model Development

Algorithm used: Linear Regression Model

Chosen for its simplicity, interpretability, and effectiveness in continuous runoff prediction.

Model training:

Train the Linear Regression model using the preprocessed dataset
Perform cross-validation to assess model stability and prevent overfitting.

Paramter optimization:

Linear Regression has no complex hyperparameters
Feature engineering was optimized.

Model Evaluation

Metrics Used:

MAE- Shows the average size of prediction errors.

R sq - Measures how well the model explains the variance in the target variable

RMSE- Indicates the average magnitude of prediction errors, giving higher weight to large errors

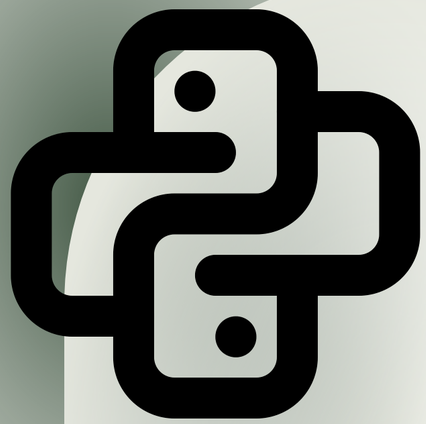
Performance comparison:

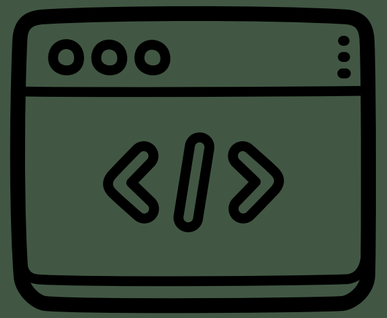
Evaluate the Linear Regression against other model previously tested (e.g.decision trees) to confirm its superiority.

Model Robustness:

Assess the model's robustness by evaluating its performance on different subsets of the dataset and ensuring consistent results.

Tools and Resources:





Jupyter Notebook

Interactive environment for data exploration and model training.

Streamlit cloud:

Deployment of the predictive web application.

Python&Libraries

Core programming language & libraries for data manipulation visualization and model development.

Open AI chat gpt

Assistance in brainstorming, refining logic, and improving code/documentation.

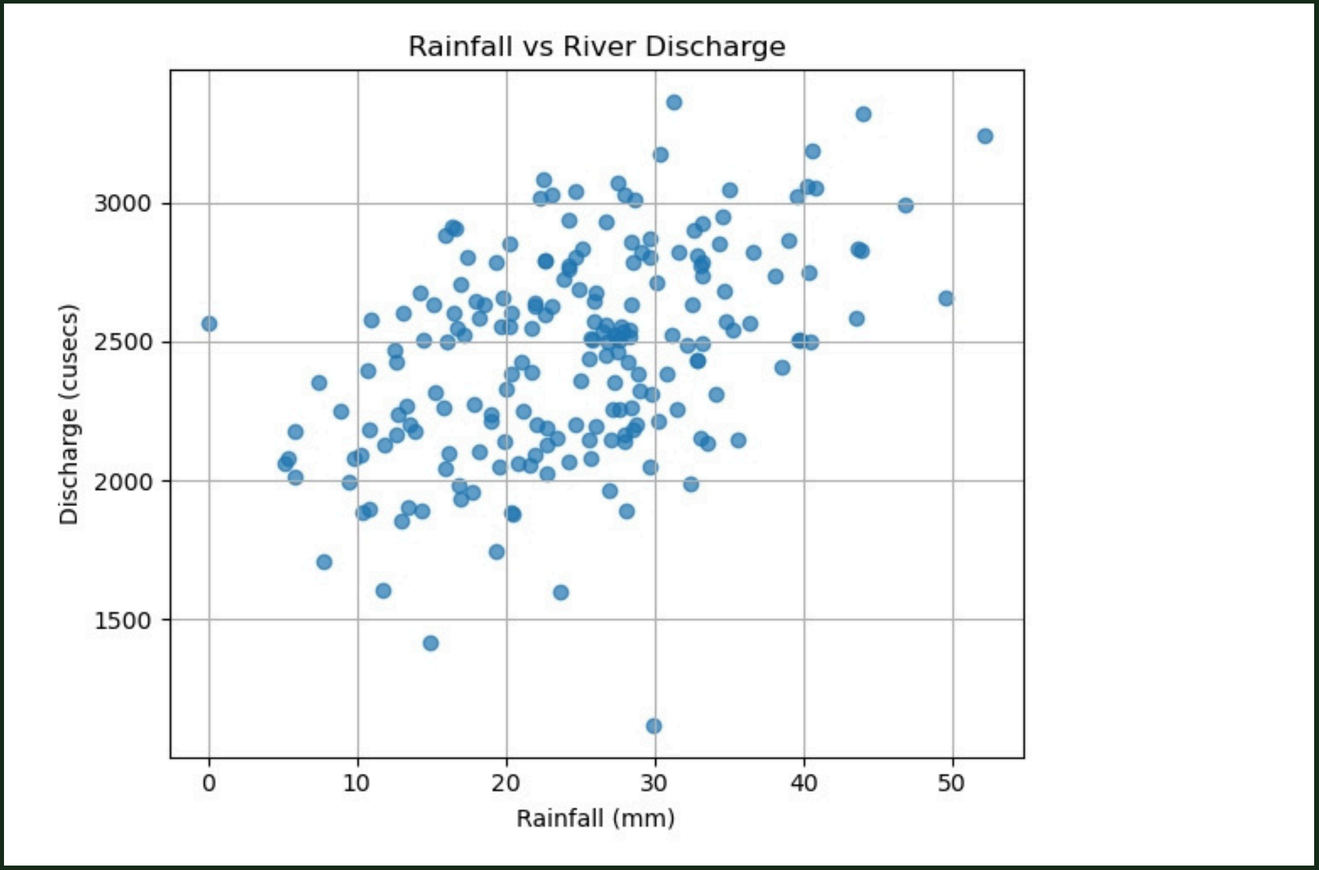
Model impact and effectiveness:

- **Flood Risk Classification**
- **Automated Alarms**
- **Early Warning Alerts**

Why it will work!

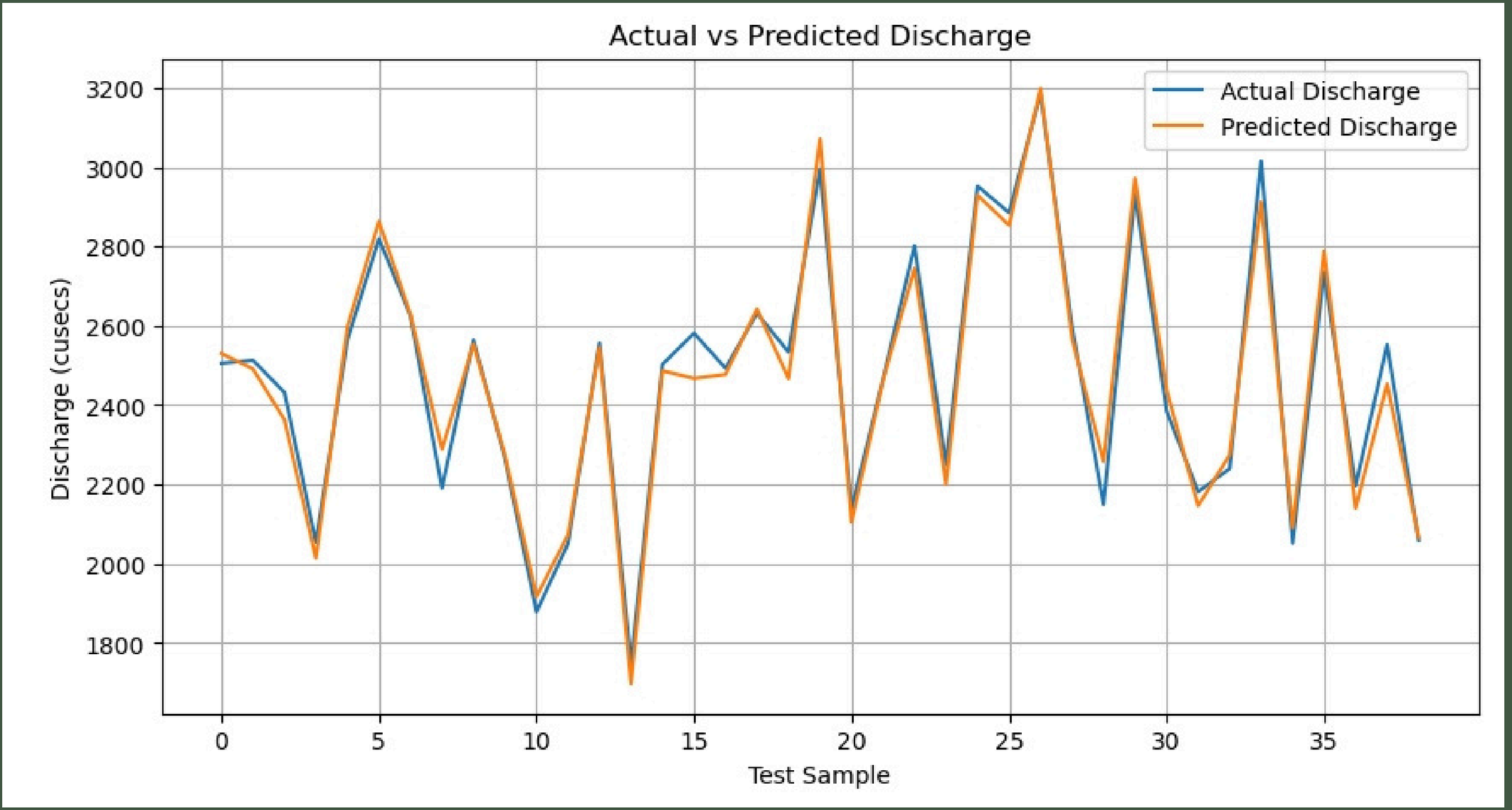
- **Data driven insights**
- **Weather API Integration**
- **Cost-Effective & Proactive**
- **Scalable & Customizable**
- **Multiple Data Inputs**

Featuring and visualizing:



Scatter plot for rainfall and river discharge for last 200 days

Prediction Result:

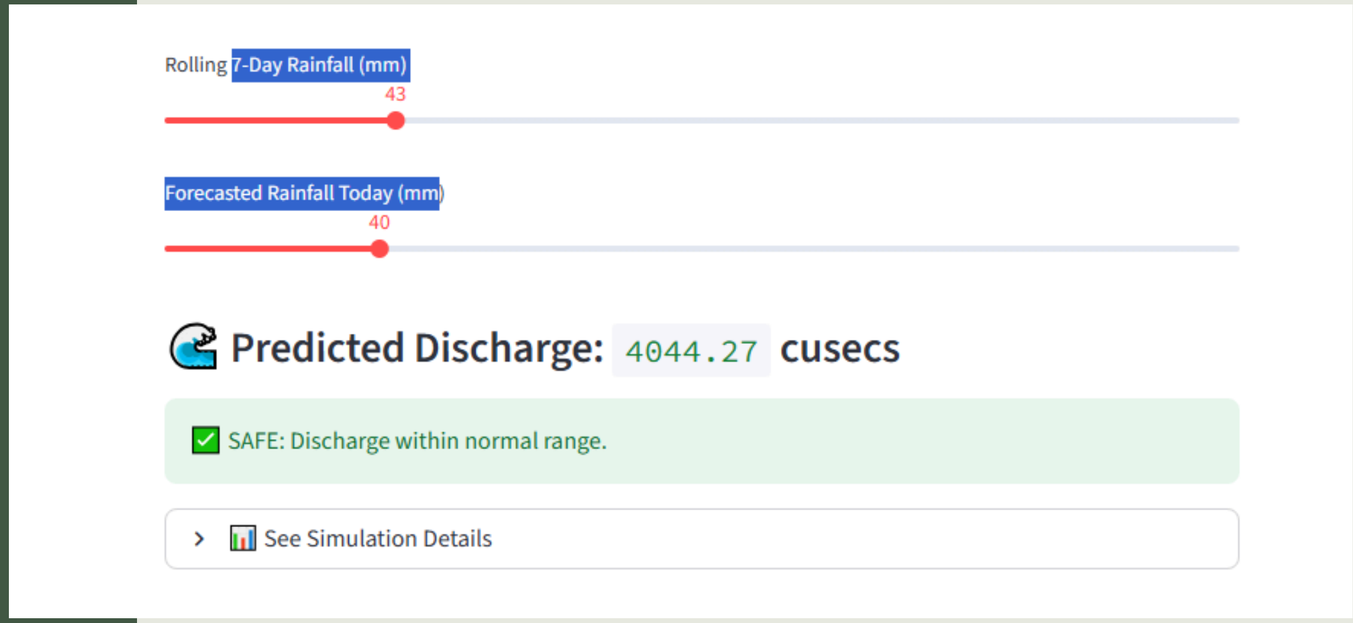


Web App:

3-Day Weather Forecast (Shimla)

	datetime	temp	rainfall
0	2025-08-08 12:00:00	19.38	3.26
1	2025-08-08 15:00:00	18.44	2.33
2	2025-08-08 18:00:00	16.96	1.21
3	2025-08-08 21:00:00	15.42	0.12
4	2025-08-09 00:00:00	15.88	0
5	2025-08-09 03:00:00	17.65	0
6	2025-08-09 06:00:00	21.07	0.66
7	2025-08-09 09:00:00	21.18	1.46
8	2025-08-09 12:00:00	20.01	1.12
9	2025-08-09 15:00:00	16.85	0.3

Real time forecasted data



River water discharge predictor

Important Links:

Web App:

https://himachal-river-update-agent-lc8mkevqodhzncthuqyefq.streamlit.app/

ML model:

https://github.com/safiya0604/Himachal-river-update-agent/blob/main/app.py

Conclusion

Summary:

Developed an AI-powered flood prediction system for Himachal Pradesh using rainfall, temperature, glacier melt, and forecast data to enable timely alerts and disaster preparedness.

Future work:

Integrate real-time IoT sensor data, enhance model accuracy with deep learning, and expand coverage to other vulnerable regions.